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[TXD 1: Physical Methods of Tests]

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Indian Standard

METHODS FOR DETERMINATION OF TWIST IN YARN

(First Revision)

UDC 677·072/·073 : 677·017·33

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 December 1985

AMENDMENT NO. 2 MARCH 2000
TO
IS 832 : 1985 METHODS FOR DETERMINATION OF TWIST IN YARN

(First Revision)

(*Page* 4, *clause* 1.2, *line* 1) — Insert the word 'ringspun' between the words 'all' and 'textile'.

(*Page* 4, *clause* 1.2, *line* 4) — Insert the following new sentence as the last sentence:

'The methods prescribed in this standard are not applicable to open end spun yarn.'

(TX 01)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 1 MARCH 1993
TO
IS 832 : 1985 METHODS FOR DETERMINATION OF TWIST IN YARN

(First Revision)

(*Clause* 0.4, *line* 4) — Substitute the following for the existing last sentence:

'Method II does not give satisfactory result with open-end spun yarn, it is suitable only when approximation of true twist is required. For more accurate results Method I (direct counting method) may be adopted.'

(TXD 01)

Reprography Unit, BIS, New Delhi, India

IS : 832 - 1985

Indian Standard

METHODS FOR DETERMINATION OF TWIST IN YARN

(First Revision)

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(*Continued on page* 2)

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Indian Standard

METHODS FOR DETERMINATION OF TWIST IN YARN

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 29 July 1985, after the draft finalized by the Physical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 This standard, which was first published in 1964, prescribed only direct count method to determine twist in yarn. This standard has now been revised to include, untwist-retwist method to determine twist in yarn.

0.3 In the revision of this standard, considerable assistance has been derived from ISO 2061-1972 Determination of twist in yarns — Direct counting method, issued by the International Organization for Standardization.

0.4 Both the methods can be used for determination of twist in single spun, plied or cabled yarns. However, direct counting method (Method I) is more suitable for plied and cabled yarns and untwist-retwist method (Method II) is preferable for single spun yarns. In case of open end spun yarns only Method II is recommended.

0.5 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes two methods for determination of direction of twist and amount of twist in terms of turns per metre of single spun, plied and cabled yarn. In case of plied and cabled yarns, direct count method also provides for determination of twist take-up and twist release.

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*Rules for rounding off numerical values (*revised*).

1.2 Methods prescribed in this standard are applicable to all textile yarns irrespective of their composition (that is, irrespective of whether a yarn is made of cotton, wool, silk, jute or man-made fibres or a blend of two or more such fibres).

1.3 Methods prescribed in this standard may be used to determine the twist of single, plied or cabled yarns removed from fabrics also.

NOTE 1 — For plied yarns direct count method should be preferred as the values obtained by the untwist-retwist method are likely to be influenced by the direction of twist of yarns.

NOTE 2 — However, in case of wool, it is not the practice to determine the twist of yarn removed from fabrics.

NOTE 3 — The turns per metre of yarn removed from fabric may not have a fair relationship with the original twist inserted in the yarn during spinning, particularly in the case of crepe fabrics wherein the crepe effect is produced by the use of highly twisted yarns.

NOTE 4 — The determination of turns per metre of yarn removed from fabric becomes impracticable when the fabric contains some types of finishing materials.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Package — A general term for bobbin, cop, pirn, cone, cheese, bundle, etc, of yarn, indicating that the yarn is in a form convenient for transport or further processing.

2.2 Twist — The spiral disposition of the components of yarn, which is generally expressed as the number of turns per unit length of yarn, for example, turns per inch, turns per metre, etc.

2.3 Twist Release — The extension in length of yarn on untwisting, expressed as a percentage of the length of twisted yarn.

2.4 Twist Take Up — The decrease in length of yarn on twisting, expressed as a percentage of the length of yarn before twisting.

NOTE — As the length of the yarn before twisting may not be known, the length of the yarn after untwisting may be treated as equal to the length of the untwisted yarn for practical purposes.

2.5 *S*-Twist — The twist in yarn due to which its spirals are in line with central portion of letter *S*, when the yarn is held in a vertical position.

2.6 *Z*-Twist — The twist in yarn due to which its spirals are in line with central portion of letter *Z*, when the yarn is held in a vertical position.

3. SAMPLING

3.1 Yarn in Packages

3.1.1 *Lot* — All the bales (or cases) of yarn of the same type, count and quality delivered to one buyer against one despatch note shall constitute a lot.

3.1.2 The conformity of a lot to a specification shall be determined on the basis of tests conducted on the sample selected from the lot.

3.1.3 Unless otherwise agreed upon between the buyer and the seller, the number of bales (or cases) to be selected at random from the lot shall be in accordance with Table 1.

TABLE 1 NUMBER OF BALES (OR CASES) TO BE SELECTED

NUMBER OF BALES (OR CASES) IN THE LOT	NUMBER OF BALES (OR CASES) TO BE SELECTED AT RANDOM
3 or less	1
4 to 10	2
11 to 30	3
31 to 75	4
76 or more	5

3.1.4 From each of the bales (or cases) selected as in **3.1.3**, 10 packages shall be salected at random.

3.1.4.1 From each of these packages, an equal number of specimens of adequate length shall be selected from different parts of the package. The exact length and the total number of test specimens so drawn (from the packages) shall be in accordance with col 2 and 3 respectively of Table 2. Before cutting each test specimen from the package, a length of about 10 metres of yarn shall be discarded. While drawing the specimens from the packages, care shall be taken to avoid any change in the twist of yarn.

NOTE — As far as possible, the test specimens shall be drawn just before testing that is, each test specimen shall be tested soon after it is drawn from the package.

3.2 Yarn from Cloth

3.2.1 *Lot* — All the bales (or cases) of cloth of the same construction and quality delivered to one buyer against one despatch note shall constitute a lot.

TABLE 2 LENGTH AND NUMBER OF TEST SPECIMENS

(*Clauses* 3.1.4.1, 3.2.4.1, 5.1, 5.2, 6.2.2.1, 6.2.3.3 *and* 7.2.3.2

TYPE OF YARN	DIRECT COUNT METHOD		UNTWIST-RETWIST METHOD	
	Length of Specimen	Number of Specimen	Length of Specimen	Number of Specimen
(1)	(2)	(3)	(4)	(5)
Single spun yarn				
Cotton type yarn	25 mm or below	100	250 mm or 500 mm	20
Worsted type yarn	50 mm or below	100	250 mm or 500 mm	20
Woollen type yarn	50 mm or below	100	250 mm or 500 mm	20
Jute type yarns:				
i) Single yarns	125 mm or below	20	250 mm or 500 mm	20
ii) Double yarns	250 mm or below	20	250 mm or 500 mm	20
Filament yarn	500 mm or below	10	250 mm or 500 mm	20
Plied or cabled yarns	500 mm or below	10	250 mm or 500 mm	20

3.2.2 The conformity of a lot to a specification shall be determined on the basis of tests conducted on the sample selected from the lot.

3.2.3 Unless otherwise agreed upon between the buyer and the seller, the number of bales (or cases) to be selected at random from the lot shall be in accordance with Table 1.

3.2.4 From each of the bales (or cases) selected as in **3.2.3**, 10 pieces shall be selected at random. From these pieces, number of warp or weft yarns as required, on which the test is to be conducted, shall be drawn as follows.

3.2.4.1 From each of the pieces selected as in **3.2.4**, an equal number of yarns (specimens) of adequate length shall be drawn from different parts of the piece. The length and the total number of specimens so drawn (in all cases) shall be in accordance with col 2 and 3 respectively of Table 2. While drawing the specimens from the pieces, care shall be taken to avoid any change in the twist of yarns.

NOTE — As far as possible, the test specimens shall be drawn just before testing, that is, each test specimen shall be tested soon after it is drawn from the piece of the cloth.

4. ATMOSPHERIC CONDITIONS FOR CONDITIONING AND TESTING

4.1 Prior to test, the samples shall be conditioned to moisture equilibrium in the standard atmosphere of 65 ± 2 percent relative humidity and

27 ± 2°C temperature from dry side as laid down is IS : 6359-1971*. The test shall be carried out in the standard atmosphere.

5. TEST SPECIMEN

5.1 Length of Test Specimen — The length of the test specimen between the inside edge of the clamps shall comply with the requirements of Table 2.

NOTE — In the case of direct count method (Method I) being used to determine twist in single spun yarn, the length of the specimen to be tested shall be less than the staple length of the fibre used to spin the yarn.

5.2 Unless otherwise specified, the number of test specimens shall be in accordance with Table 2.

NOTE — The exact number of tests to be made for each type of yarn depends upon the estimated or assumed coefficients of variation of individual values and the permissible error in the estimate of the test results at a desired probability level. The value given in Table 2 for number of test specimens have been calculated assuming the following coefficients of variation for the respective individual values, with a permissible error of 5 percent at probability level of 95 percent.

Type of Yarn	*Assumed Coefficient of Variation, Percent*	
	Direct Count Method	Untwist-Retwist Method
(1)	(2)	(3)
Yarn spun on cotton system	25	10·5
Yarn spun on worsted system	25	10·5
Yarn spun on woollen system	25	10·5
Jute yarn	25	10·5
Filament yarn	8	10·5
Plied or cabled yarn	8	10·5

If however, all the particulars for calculation of exact number of tests specimens are available, the test may be conducted accordingly.

6. METHOD I DIRECT COUNT METHOD

6.1 Apparatus — The direct counting type twist tester shall conform to the following requirements:

a) The twist tester shall be provided with:

   1) two clamps (or jaws) one rotatable and other non-rotatable to grip the test specimen;

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*Method for conditioning of textiles.

2) a scale graduated in centimetres and millimetres to measure the distance between clamps;

3) a revolution counter positively connected to the rotatable clamp and capable of recording the number of revolutions of the clamps to an accuracy of:

   i) one turn, for testing specimen of length more than 50 mm,

   ii) one tenth of a turn, for testing specimen of length equal to or less than 50 mm and for testing yarn with low twist;

4) a suitable scale, graduated in millimetres to measure the elongation or contraction of the test specimen; and

5) a suitable magnifying glass to examine visually the test specimen during the test.

b) The distance between the clamps shall be capable of being set to any distance up to 500 mm as required.

c) The rotatable clamp shall be capable of being revolved in either direction on its axis common to the longitudinal axis of the test specimen.

d) The revolution counter shall be capable of being set to zero mark after each test.

e) The non-rotatable clamp shall be mounted on its support in such a manner that the required tension could be applied to the test specimen.

6.2 Procedure

6.2.1 *Direction of Twist* — Hold one end of the yarn in such a position that a short length (at least 100 mm) is suspended in a verticle position. Examine the verticle section of the yarn and determine if the shape of yarn elements conform to the shape of central portion of the letters '*S*' or '*Z*'. Note the direction of twist as "*S*" or "*Z*" as observed.

6.2.2 *Twist in Single Yarn*

6.2.2.1 Set the clamps so that the distance between the clamps is equivalent to the applicable value of the length of test specimen specified in Table 2 and ensure that the distance so set is within an accuracy of one percent or 0·5 mm whichever is greater. Set the revolution counter to zero position. Set the tensioning device so as to apply a tension of about tex/2 g ± 10 percent (*see* Note) on the test specimen.

NOTE — It is assumed that the universal count, in tex, of yarn under test would be known and if not known would be determined by weighing a known length of yarn taken from the conditioned sample. In case of jute yarns a pretension of tex/4 g ± 10 percent may be used.

6.2.2.2 Secure the free end of the test specimen in the non-rotatable clamp. Pass the other end of the specimen through the open rotatable clamp and pull it through the clamp till the specified pre-tension becomes effective, and then secure the specimen.

6.2.2.3 Determine the direction of twist, *S* or *Z* (*see* **2.5** and **2.6**), by visually testing the specimens.

6.2.2.4 Revolve the rotatable clamp in the proper direction so as to untwist the specimen. Continue the rotation in the same direction until it is possible to pass a needle from one clamp to the other between the untwisted fibre of the specimen; use the magnifying glass, if necessary, to make sure that all the twist has been removed. Note down the number of turns.

6.2.2.5 From the value obtained in **6.2.2.4** and the length of the test specimen before untwisting, calculate the turns per metre in the test specimen.

6.2.2.6 By following the procedure given in **6.2.2.1** to **6.2.2.5** determine the turns per metre in the remaining test specimens. Calculate the mean of all the values so obtained and the coefficient of variation.

6.2.3 *Twist in Plied Yarn*

6.2.3.1 Determine the direction of twist and the number of turns in the test specimens by following the procedure prescribed in **6.2.2.1** to **6.2.2.4** but noting, for the purpose of **6.2.2.4** the end-point of the test when it is possible to pass a needle between component yarns of the specimen. Record also the extension in length obtained on untwisting the test specimen.

6.2.3.2 From the value of number of turns obtained in **6.2.3.1**, and the length of the specimen before untwisting, calculate the turns per metre in the test specimen.

6.2.3.3 Cut off all but one component strand of single yarn close to the inside edges of the clamps. Test the component strand (still in the clamps) of single yarn for the direction of twist and the number of turns by following the procedure given under **6.2** and **6.2.2** but adjusting the length of the test specimen to comply with the requirements of Table 2.

NOTE — It is assumed that all the component single yarns have the same amount of twist. If this fact is not known, it should be verified. If it is found that they differ in respect of the amount of twist, each component yarn shall be tested and the results reported.

6.2.3.4 Test similarly the remaining test specimens for turns per metre of the plied yarn and the component single yarns, and twist take-up and twist-release of plied yarn. Calculate the mean of all the values so obtained and the coefficient of variation of the values.

6.2.4 *Twist in Cabled Yarn*

6.2.4.1 Determine the direction of twist, and the number of turns in the test specimens by following the procedure prescribed in **6.2.2.1** to **6.2.2.4** but noting, for the purpose of **6.2.2.4** the end point of the test when it is possible to pass a needle between the strands of the component plied yarn of the specimen. Record also the extension in length obtained on untwisting the test specimen.

6.2.4.2 From the value of number of turns obtained in **6.2.4.1** and the length of the specimen before untwisting, calculate the turns per metre in the test specimen.

6.2.4.3 Cut off all but one component strand of the plied yarn, close to the inside edges of the clamps. Test the component strand of plied yarn for the direction of twist and the number of turns per metre, in the plied and component single yarns (still in the clamps) by following the procedure given in **6.2.3**.

NOTE — It is assumed that all the component plied yarns have the same amount of twist. If this fact is not known, it should be verified. If it is found that they differ in respect of the amount of twist, each component yarn shall be tested and the results reported.

6.2.4.4 Test similarly the remaining test specimens for turns per metre of the cabled yarn, of the component plied yarns, and of the component single yarns; the twist take-up and twist-release of cabled yarn and of plied yarn. Calculate the mean of all the values so obtained and the coefficient of variation of turns per metre values.

7. METHOD II UNTWIST-RETWIST METHOD

7.1 Apparatus — The untwist-retwist type of twist tester shall conform to the following requirements:

a) The twist tester shall be provided with:

   1) a pair of jaws — the rotatable and other non-rotatable (called movable) — to hold the specimen of yarn by each of its extremities;

   2) a revolution counter positively connected to rotatable jaw and capable of recording the number of revolution of the jaw,

3) means of a sliding support so that the distance between the jaws may be adjustable in order to permit measurements of the length of yarn;
4) a scale graduated in centimetre and millimetre to measure the distance between the jaws;
5) means shall be provided either by dead weight or by displacement of verticle pendulum for applying tension to the specimen and maintaining that tension until permitted elongation is obtained;
6) means shall also be provided for rapidly determining the specimen length to an acuracy of ± 0·5 mm; and
7) means shall also be provided to prevent specimen under test extending more than 2 percent, for example by means of stop;

b) Rotatable jaw may be motor driven or hand driven at speed in excess of 820 turns per minute;
c) Movable jaw, situated in the extension of the arm of rotatable jaw is mounted so that it is capable of being displaced and stopped in the direction of this axis;
d) Movable jaw shall not be able to be turned about its own axis;
e) The sliding support shall not permit play affecting the length of test specimen;
f) The distance between the jaws shall be capable of being set to any distance as required; and
g) Revolution counter shall be capable of being set to zero mark after each test.

7.2 Procedure

7.2.1 *Direction of Twist* — Determine the direction of twist in the yarn by the procedure mentioned at **6.2.1**.

7.2.2 *Twist in Single Yarn*

7.2.2.1 Position the movable jaw so that the distance between the jaws is 250 or 500 mm. Adjust the tensioning device to apply a tension of tex/2g ± 10 percent. Set the yarn specimen elongation stop so that tension ceases to be applied after the yarns are extended by 1 percent. Set the revolution counter to zero.

7.2.2.2 Taking care not to disturb the twist, secure the free end of test specimen in the movable jaw (non-rotatable). Pass the other end of the specimen through the open rotatable jaw and pull it through the jaw till the specified pretension becomes effective and then secure the specimen.

7.2.2.3 Untwist the yarn operating the rotating jaw at a speed of at least 800 turns per minute. Then retwist the yarn in the opposite direction until the specimen elongation indicator returns to zero. Record the number of turns in the counter. Reset the counter to zero before testing a new specimen.

7.2.2.4 From the value obtained in **7.2.2.3** and length of the test specimen before untwisting, calculate the number of turns per metre by the following formula:

$$tpm = \frac{500\,n}{l}$$

where

tpm = turns per metre,

n = number of revolutions measured from revolution counter to untwist and retwist the yarn, and

l = length of test specimen in mm.

7.2.2.5 By following the procedure given in **7.2.2.1** to **7.2.2.4** determine the turn per metre of the remaining test specimens. Calculate the mean of all values and coefficient of variation of the values.

7.2.3 *Twist in Plied Yarn*

7.2.3.1 Determine the number of turns per metre by following the procedure prescribed in **7.2.2.1** to **7.2.2.5** and direction of twist as prescribed in **7.2.1**.

7.2.3.2 Cut off all but one component strand of single yarn close to the inside edges of the jaws. Test the component strand (still in jaws) of single yarn for the direction of twist and number of turns by following the procedure given in **7.2** but adjusting the length of the specimen to comply with the requirements of Table 2.

NOTE — It is assumed that all the component single yarns have the same amount of twist. If this fact is not known, it should be verified. If it is found that they differ in respect of the amount of twist, each component yarn shall be tested and the results reported.

7.2.3.3 Test similarly the remaining test specimen for turns per metre of the plied yarn and of the component single yarn. Calculate the mean of the values so obtained and the coefficient of variations of the values.

7.2.4 *Twist in Cabled Yarn*

7.2.4.1 Determine the direction of twist of test specimens as prescribed in **7.2.1** and number of turns per metre by following procedure prescribed in **7.2.2.1** to **7.2.2.5**.

7.2.4.2 Cut off all but one component strand of the plied yarn, close to the inside edges of the jaws. Test the component strand of plied yarn for the direction of twist and number of turns per metre in plied and component single yarns (still in the jaws) by following procedure given under **7.2.3**.

NOTE — It is assumed that all the component plied yarns have the same amount of twist. It this fact is not known, it shall be verified. If it is found that they differ in respect of the amount of twist, each component yarn shall be tested and the results reported.

7.2.4.3 Test similarly the remaining test specimens for turns per metre of the cabled yarn, of the component plied yarns of the component single yarns. Calculate the mean of all the values so obtained and coefficient of variation of turns per metre values.

8. REPORT

8.1 The test report shall include the following:

a) Type of yarn;

b) Method used, Method I or Method II;

c) Direction of twist '*S*' or '*Z*' of plied yarn and of the component single yarns;

d) Length in millimetres of the specimen;

e) Number of specimens tested;

f) Pre-tension used;

g) Mean value of turns per metre of plied yarn and of component single yarn;

h) Coefficient of variation of turns per metre value of plied yarn, if desired;

j) Men value of twist take-up and twist-release of plied yarn;

k) Mean value of the turns per metre of the cabled yarn and the coefficient of variation of the turns per metre values, if desired; and

m) Mean value of the twist take-up and twist-release of the cabled yarn.

INDIAN STANDARDS ON PHYSICAL METHODS OF TEST

SP : 11-1973	Recommended SI Units for Textiles
SP : 15-1981	ISI Handbook of Textile Testing
IS : 232-1967	Glossary of textile terms-natural fibres (*first revision*)
IS : 233(Parts 1 to VI)-1978	Methods for determination of length parameters of cotton fibres (*first revision*)
Part 1	General (*first revision*)
Part 2	Estimation of length and length distribution by the arrary method (*first revision*)
Part 3	Estimation of length and length distribution by the fraction method (*first revision*)
Part 4	Estimation of mean fibre length by cut and weigh method (*first revision*)
Part 5	Estimation of length and length distribution by the thickness scanning method (*first revision*)
Part 6	Estimation of length and length uniformity by the optical scanning method (*first revision*)
IS : 234-1973	Linear density of textile fibres (gravimetric method) (*first revision*)
IS : 1670-1970	Method for determination of breaking load, elongation at break and tenacity of yarns (*first revision*)
IS : 1954-1969	Length and width of fabrics (*first revision*)
IS : 1963-1981	Threads per unit length in woven fabrics (*second revision*)
IS : 1964-1970	Weight per square metre and weight per linear metre of fabrics (*first revision*)
IS : 1966-1975	Bursting strength and bursting distension of fabrics — Diaphragm method (*first revision*)
IS : 1969-1969	Breaking load and elongation at break of woven textile fabrics (*first revision*)
IS : 2364-1979	Glossary of textile terms — fabrics made from natural fibres (*first revision*)
IS : 2702-1965	Thermal resistance of textile fabrics, guarded hot-plate method
IS : 3689-1966	Conversion factors and conversion tables for yarn counts
IS : 4125-1967	Glossary of terms pertaining to defects in fabrics
IS : 4681-1981	Recovery from creasing of textile fabrics by measuring the angle of recovery (*first revision*)
IS : 6359-1971	Conditioning of textiles
IS : 6489-1971	Tear strength of woven textile fabrics by Elmendorf tester
IS : 6490-1971	Stiffness of fabrics — cantilever test
IS : 6668-1972	Preparing test specimens from fabrics samples for physical tests
IS : 7702-1975	Thickness of woven and knitted fabrics
IS : 8357-1977	Assessment of fabric drape
IS : 10971-1984	Pilling resistance of fabrics
IS : 11056-1984	Air permeability of fabrics

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